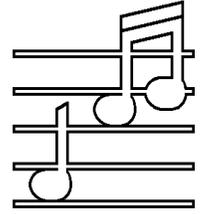


# AUDIO BASICS



A MONTHLY NEWSLETTER OF AUDIO INFORMATION

VOLUME TEN NUMBER EIGHT AUGUST, 1991

---

## The New Grado Headphones Are the Best We Have Heard!

We have received our first pair of Grado SR-200 headphones last week and we are more than impressed. It is hard to describe their sound except in comparison with other phones and speakers because they do nothing wrong that one can comment on. After listening to music with them, going back to the shop Sennheiser phones (ones written up herein a few years ago) is an interesting experience – the Grados simply make the other phones sound broken – kind of an instant stuff your ears with tissue experience.

More unsettling was to compare the Grado phones with my pet B&W 801 Matrix loudspeakers. For pure transparency and definition, the Grado phones win hands down! You cannot play the Grado phones as loud and they do not reach as deep as powerfully as the big B&W speakers (they do play deep bass extraordinarily well for a headphone), but if you are searching for amazing definition and transparency with no rough edges at all, perhaps you had better be considering these headphones instead of better speakers.

I am not 100% happy with the comfort of the Grado phones – the ear pads are a bit stiff and the headband is a bit hard. But I suspect they will get more comfortable as they break in and I am certain they will be durable. The connection cable is a sturdy round cord with a regular size 1/4" stereo phone jack fitting (no toy connectors here). There is a lot of adjustment range up and down on the ear cups and to fit a smaller head you simply bend in the headband (although this may cause the angle of the relationship of the pads to your ears to be improper if you bend the band in too far). They do not isolate well. Room noise gets in and some high frequencies get out (the backs of the drivers are mostly open) so they are not for the diehard isolationist. To get my samples early, I had to forgo the packing material (delivered in a plain clear sack) so I cannot tell you what accessories are supplied or what the warranty is yet. I instantly ordered more to have them for you, but we have not received our first production order yet (any day now as soon as the boxes are ready).

The three models are the SR-100 listing at \$150, the SR-200 with matched headphone drivers listing at \$200, and the SR-300 with fancy gold jacks and cables at \$275. We have standardized on the SR-200 to get the best of the sound without unnecessary frills and our price to *Audio Basics* subscribers is \$169.00 for the time being (including shipping in the continental USA). You can order now, we should have inventory very soon.

The bottom line is that these are the highest definition and most transparent headphones any of us have yet heard, and their ability to reach way into the spirit of the music is even better than the most expensive loudspeakers can do. I am really glad we build a great little headphone amplifier circuit (\$100 option in our solid state preamps or \$295 for a free standing unit) because the Grado phones tell us that was the right thing to do. You don't want to listen to these phones with the gritty little headphone outputs on your cassette deck or portable CD player. They will tell you just how bad that equipment is. But if you use the Grado phones properly, nothing in the high fidelity world will be better at letting you experience the music. If you love music, you need a pair of Grado headphones.

There is no used equipment for sale this month (but we have received a few more B&W Acoustitune Sub-Woofers - call us about these now). The remainder of this issue tells you about some of our new ideas.

*Frank Van Alstine*

## An Improved St-70 Rebuild – the Super 70i

We are pleased to announce a significantly improved and re-tooled Super 70i audio card for the Dyna St-70 amplifier and improved pictorial diagrams for the rebuild plans at no increase in the \$195 kit price. *In fact, for Audio Basics subscribers only, the special introductory price for the upgraded rebuild kit is \$170 + shipping until 10/1/91.*

The amplifier sounds better than ever because we have re-engineered the biasing of the input stage giving it improved drive capability in both directions. You will hear better dynamic range, better bass, better definition, extended highs, and even better imaging.

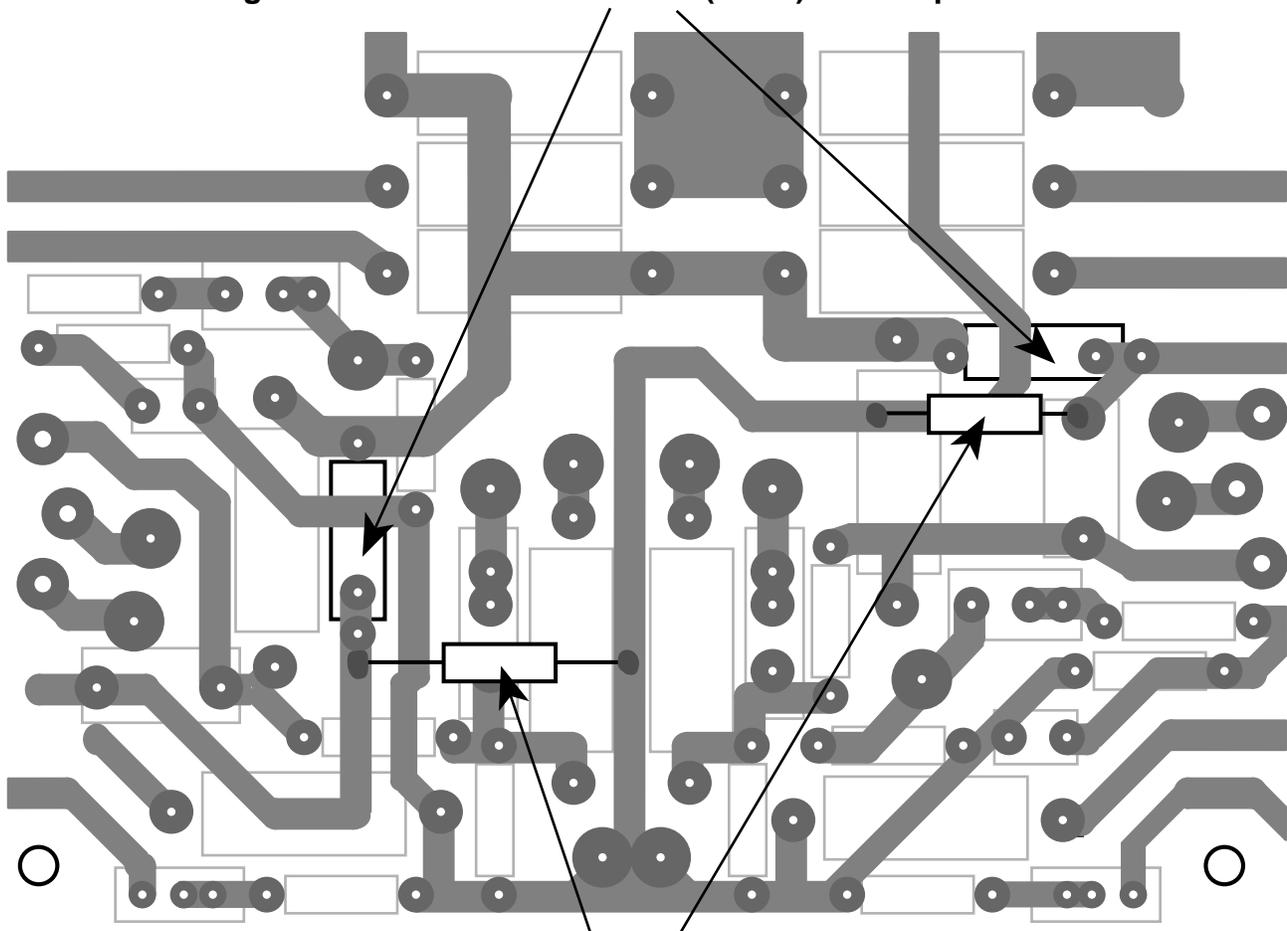
We are printing a slightly condensed version of the complete kit plans herein so you can see how easy it is to build. Note that the full plan set when ordered separately or with the kit includes pictorial diagrams of the rebuild with the AVA power transformer and the original Dyna pictorial too. It is also supplied in a larger and easier to read type size.

The engineering improvements work both with circuits upgraded with 6GH8A tubes and with boards still using the original 7199 tubes. In fact, the re-biasing really helps tired old 7199 tubes. After our circuit changes, tubes that gave up and clipped before driving to the negative rail properly will now be more likely to make full power.

The basic circuit improvements can be retrofitted to your existing Super Seventy PC-189 board as shown on the foil side view below (either with original boards designed for the 7199 tubes or boards updated for 6GH8A tubes).

All you need to do is to locate and replace the two 1.5 M $\Omega$  resistors with 750K $\Omega$  1/2 watt resistors and install two new 270K $\Omega$  1/2 watt resistors on the foil side of the board as shown. Make sure the leads do not touch other foil paths or wires. Enjoy the improvements and let us know what you think.

### Change from 1.5M $\Omega$ to 750K $\Omega$ 1/2W (RN60) on Component Side



### Add 270K $\Omega$ 1/2W (RN60) on Foil Side

## Audio by Van Alstine Super 70i Rebuild Instructions, Drawings, Schematic, and Parts List

### Preliminary Observations.

We advise that you start with a known working St-70 amplifier. The time to find out that you have expensive transformer problems is not after purchasing and installing our rebuild kit. You need not have a good sounding or totally perfect St-70 to start with. Since this kit replaces the quad filter capacitor, replaces the entire bias supply, and replaces the entire audio circuit many old "problems" will be thrown away along with the old circuits. But make sure your old problems are not transformer problems as those parts will be re-used. You will be salvaging the chassis, the transformers and their wiring, the power and rectifier tube sockets and wiring, and the jacks and power switch. However, since the PC card and its wiring will be gone, you will have a good opportunity to clean up your chassis before re-wiring it.

The musical quality, the output power, and the noise characteristics of the Super 70i absolutely depend upon the quality of its vacuum tubes. It is absolutely necessary to have high gain, quiet, fast, and non-microphonic vacuum tubes to make full power (25 watts RMS per channel – the original 35 watt rating was a fictitious "peak power" rating) and to make wide band audio performance. A complete re-tube set (4 - 6CA7, 2 - 6GH8A, and 1 - 5AR4) is about \$100.00 from Sound Values, Box 551, Dublin, Ohio 43017 (614-279-2383).

Note: The Super 70i does not provide a power take-off for the obsolete mono Dyna PAM-1 preamps and does not use the mono-stereo switch. If you are using these functions and insist on doing so then do not start this project.

Remember that the St-70 runs hot, is risky to ship because of broken tubes and possible chassis damage, and will need ongoing service (periodic bias adjustments and re-tubing). It is not the amplifier for "lazy" people or for those that don't want to learn how to do their own service. You will need to own and use a decent DC voltmeter to make absolutely necessary bias adjustments, and you will need to understand how to service the unit yourself because having a professional do it will be too expensive.

### Limited warranty.

Our limited warranty is 90 days on properly installed parts only, limited to the parts we furnished (except vacuum tubes – there is no industry warranty at all on vacuum tubes). Return the defective part to us, prepaid, and we will send you a prepaid replacement. We cannot warrant your workmanship and we cannot warrant parts that have been damaged by improper installation.

### Rebuild Kit Instructions.

Read all the instructions first and then check your parts against the parts list.

Lets start out by building your new AVA PC-189A circuit board. This way you can make sure you can do good solder work before you tear apart your original St-70. If you get started and decide that kit building is not for you, pack the whole mess up and ship it to us (call us first for packing and shipping advice) and we will build the project for you for an additional \$150.00 plus return shipping.

1. Refer to the drawing of the parts layout for the PC-189A board and the parts list.
2. Locate two each of R1 through R6 and R9, R11, R12, and R21 and install and solder the 20 resistors in the appropriate locations on PC-189A. If you are supplying your own parts select R11 and R12 to match each other within 1%. All parts are installed on the fiberglass side with the bodies flush against the board and soldered on the foil side with a good grade of rosin core solder (Ersin Multicore brand recom-

### List

mended). Note that all 1/2 watt resistors are spaced on 0.5" centers (a #1 bend on a standard resistor ladder if you have one).

Note: if color coded resistors are supplied, the value code is: black = 0, brown = 1, red = 2, orange = 3, yellow = 4, green = 5, blue = 6, violet = 7, grey = 8, white = 9, gold = 5% tolerance. The first two bands give the numerical value, the third band the number of zeros, and the 4th band the tolerance. For example "blue, red, brown, gold" = 620 ohm 5%, while "brown, green, green, gold = 1500000 ohm 5% or 1.5 MΩ!

3. Install two each of R7, R8, R10, R13, and R14. These may be supplied as 2W or 3W types. If you are supplying your own parts select R8s to match each other within 1% and select R7 and R13 to match each other within 1%.
4. Install R15 and R16. These replace the resistors wired to your old quad filter capacitor.
5. Install R17 and R18.
6. Now install the two new 9-pin tube sockets. Make sure you have them straight before soldering all connections as it is difficult to unsolder all the connections at once later if you get the sockets crooked.
7. Install two each of C1, C2, C3, C4, & C5 and solder. Note there are alternate mounting holes for some parts to accommodate more than one body size and style.
8. Install two each of C6 and C7 and solder (as usual).
9. Install D1 and note that its banded end points towards the closest side of the card.
10. Install C8 and C9 and note that their + leads (the longer leads) go into the holes marked + (closest to the row of large capacitors).
11. Install C10 and note that its hot (+) lead goes towards the rear of the card (closest to D1).
12. Install C11, C12, and C13 and note that their + leads go in the + holes closer to the front of the PC card (reversed in relation to C10).

Congratulations, you have finished your new amplifier circuit board. It better have all part bodies flush against the board and all leads soldered. Be very sure all your connections are good and that you have not slopped solder from one foil path to another (a solder "bridge") because that would short out the circuit and cause it to fail. Inspect your work very carefully. It is much easier to find and correct mistakes now than when the board is mounted in the amplifier.

Now you will start tearing apart your stock St-70. Starting with a cold unplugged unit, remove the 7 tubes and set them aside (keeping matched pair output tubes together if necessary) and take off the bottom plate. You will be re-using the output and rectifier tubes, but discarding the old 7199 tubes as they are replaced with the new 6GH8A tubes supplied with the kit.

Refer to the pictorial diagram for the identification of the parts referred to in these instructions.

13. From the bottom, clip off all wires (and resistor leads) attached to the original Dyna PC -3 card very close to the card. Unfasten the four sets of screws and nuts holding the card into the chassis and remove the card. Your original PC-3 board is now a conversation piece.
14. Remove all the wires from the two front panel power-take-off tube sockets except the wires to pin 8 of each socket, the bias set connections, which remain in place.

15. A pair of twisted wires, previously connected to the power-take-off sockets remains connected at pins 2 and 7 of V3 and V6. Remove these "dangling" twisted pairs and clean these socket lugs so that another twisted pair can be connected at each socket later. A twisted pair remains connecting pin 2 and 7 of V3 to pin 2 and 7 of V2, and from V6 to V7.
16. Remove the 1000 ohm resistors from pins 5 and 6 and the wires connected to pin 6 at V2, V3, V6, and V7. Clean each pin 5 for the future connection of a new lead at each 6CA7 socket.
17. Remove all the wires and the two resistors from the input jacks. You can remove the stereo-mono switch as it is not used with this circuit. It provided a low definition paralleled channel mono operation not useful with modern high definition speakers.
18. Now is the time to replace the input jack set if it is worn (make sure the input grounds cannot contact the chassis). If you are re-cycling the originals, tighten the hardware, slightly crimp the inner contacts for firmer connections to RCA plug center pins, and clean the surfaces with Cramolin and an old toothbrush. Also clean the two bias potentiometers with Cramolin, and rotate them full travel several times.
19. Remove the two 50  $\mu$ F capacitors and the two 10K $\Omega$  resistors from lugs 1, 2, 3, and 4 of the seven lug terminal strip and remove the wires attached to lugs 1, 2, 3, and 4. Remove the free wire still connected at lug 6, but leave the two transformer leads and the dual .02  $\mu$ F capacitors undisturbed.
20. Carefully unsolder the two red transformer leads and the two brown choke leads at the quad filter capacitor, salvaging as much lead as possible. These four wires will later attach to the new PC-189A through the hole in the chassis when the quad filter capacitor is removed.
21. Clip off all the other parts and wires at the quad filter capacitor and remove it from the chassis by bending its mounting lugs straight again or breaking them off.
22. Unsolder the red/yellow transformer lead from the ground lug near the filter capacitor hole, clip off the other wires, and remove the ground lug. Its mounting hole will be a future PC card standoff mounting hole.
23. Carefully unsolder the red/black transformer lead at the selenium rectifier and clip off the remaining wire. Remove the selenium rectifier.
24. Unsolder and remove the wires from lug 2 of each bias potentiometer. With any luck the free ends of the wires at lug 1 and lug 3 of the bias potentiometer nearest the 5AR4 V1 socket will be more than long enough to reach their new B1 and B3 eyelets on the new PC-189A card.
25. Unsolder the black wires from lug 1 of each output terminal, leaving the yellow output transformer leads connected. The black wires connected at lug 4 of each output terminal are long enough to reach the location of new chassis ground connection so they remain as is for now.
26. Look closely at the two 15.6 ohm precision resistors mounted at V2 and V7. Measure them with a precision voltmeter if possible. Although they usually are fine, if they appear scorched or if they measure out of tolerance, replace them. Sound Values stocks these special parts.
27. The chassis is now "cleaned out" as far as necessary. Now is a good time to really clean it up. Get in there with a toothbrush, Ronsonol lighter fluid, Cramolin, and a little care and make that old metal shine again, and get all the dirt out of the corners! Its a good time to scrub the cover cage with soap and water too, dry it thoroughly and give it a couple of coats of Rust-Oleum satin black spray paint, inside and out.

Now is the time to inspect and replace any worn or broken parts. Check the chassis mounted tube sockets, the output jacks, the fuseholder, the power switch, and the AC wiring and power cord. Note that you can swap the now unused mono-stereo switch for a worn power switch and swap the front panel tube sockets for defective top of chassis ones (all you need is good pin 8s on the front panel sockets). Make sure the bottom feet are tall enough to raise the chassis at least 1/4" clear of the shelf for adequate cooling. Radio Shack has good "stick-on" feet.

## Final Assembly of Super 70i.

1. Install the three lug terminal strip inside the chassis with a set of #6 hardware in the old selenium rectifier location (between the bias pots). Tighten the mounting hardware very firmly at the center lug of this strip as this lug will be the new main chassis ground.
  2. Although the Red/Black transformer lead is supposed to go to the new PC card (to the eyelet marked Rd/Bk) it is very likely this lead will be too short or too stiff to reach. If so, solder this lead to an ungrounded end lug on the three lug terminal strip. A new wire will later be connected from this lug to the PC card, effectively "splicing" the transformer lead and making it long enough.
  3. After rerouting to neatly fit, connect the free ends of the wires from each output terminal lug 4 to the center (ground) lug on the new terminal strip. Don't solder yet. A total of 5 wires will be connected here (7 wires counting the two bare ground shield wires if the new AVA transformer is used).
  4. Connect the red/yellow transformer lead to the center ground lug on this terminal strip. Note that if you run out of room, you can jump a lug on either side of the center to the center ground to give yourself more connection space. Don't connect the red/black lead to ground though - it must eventually be connected only to the Rd/Bk eyelet on the PC card.
  5. Connect a wire from lug 6 of the 7 lug terminal strip to the ground lug on the new 3 lug terminal strip. You can solder all connections now, but leave room for one more ground connection to the new PC card.
  6. With a #6 lockwasher installed on each of four #6-32 screws, fasten a #6/32 threaded 1/2" spacer to the top of the chassis at three original PC card mounting holes - the two front original PC card mounting holes and the original PC card mounting hole near the 5AR4 tube, and at the old ground lug hole near the quad filter cap hole. Leave these spacers finger tight for now.
  7. Make a final inspection of the solder work on your new PC card, part of it will be impossible to see later. Locate the PC card on top of the chassis on the four spacers, insert four more #6-32 screws with lockwashers through the mounting holes in the PC card, and screw them into the spacers. With any luck at all everything will line up fine and the bias trim pots will be accessible through the two holes in the PC card. Tighten the screws firmly both on top of the PC card and on the bottom of the chassis.
- Note that the new PC-189A has its eyelets numbered on the foil side and that the numbering matches the original Dyna layout where possible. Note that all connections are made from the bottom (foil) side of the card.
8. Connect a wire from each ground lug on the input jack to an eyelet 9 (there are two, close together).
  9. Connect a wire from the left input jack hot side (the longer inner terminal) to eyelet 7.
  10. Connect a wire from the right input jack hot side to eyelet 17.

11. Connect a twisted pair of wires from pins 2 and 7 of V6 to eyelets 15 and 16 on the PC card. Route this twisted pair along the front edge of the chassis under the power-take-off socket.
  12. Connect a twisted pair of wires from pins 2 and 7 of V3 to eyelets 4 and 5 on the PC card. Route this twisted pair along the front edge of the chassis under the power-take-off socket.
  13. Prepare four 1K $\Omega$  resistors (2 R19 and 2 R20) by stripping four 1.25" pieces of insulation from the hookup wire and slipping the insulation on one lead of each resistor.
  14. Connect one insulated 1K $\Omega$  lead to eyelet 23. Connect the other end to V6 pin 5 keeping the resistor leads and body clear of the chassis.
  15. Connect the other three 1K $\Omega$  insulated leads to eyelets 22, 1, and 2. Connect the other ends to pins 5 on V7, V2 and V3 respectively.
  16. Connect a wire from left bias pot lug 2 to eyelet 6 on the PC card.
  17. Connect a wire from right bias pot lug 2 to eyelet 21 on the PC card.
  18. Trim to fit and connect the free end of the wire from left bias pot lug 1 to eyelet B1 on the PC card.
  19. Likewise, connect the free end of the wire from left bias pot lug 3 to eyelet B3 on the PC card.
  20. Connect the free end of the wire from V3 pin 4 to eyelet 11 on the PC card, keeping the wire clear of the board.
  21. Connect a wire from left output terminal lug 1 to eyelet 12 on the PC card. Route this wire away from the power transformer.
  22. Connect a wire from right output terminal lug 1 to eyelet 13 on the PC card. Route this wire away from the power transformer.
  23. Connect a wire from V6 lug 4 to eyelet 14 and keep this wire clear of the board.
  24. Connect a heavy wire from eyelet "GND" on the PC card to the ground (center) lug at the new 3 lug terminal strip and solder all five wires connected here (7 wires including the ground shield wires if the new A.V.A. transformer is used).
- The following connections are accessed through the old capacitor mounting hole.
25. Connect the Red/Black transformer lead (or its extension from the 3 lug terminal strip) to the Rd/Bk eyelet on the PC card.
  26. Connect one Red transformer lead to a Red eyelet on the PC card.
  27. Connect the other Red transformer lead to the remaining Red eyelet on the PC card.
  28. Connect the two Brown choke leads to the two Brn eyelets on the PC card.
  29. If using the original Dyna power transformer, connect a wire from V1 pin 8 to the B+ eyelet on the PC card. Note that a white transformer lead remains connected at pin 8. If the new A.V.A. transformer is installed, the B+ wire is connected from the diode terminal strip to the B+ eyelet on the PC card in accordance with the diagram supplied with the new power transformer.
  30. Well – its all wired and it should look a lot tidier and more modern than ever - and just wait until you hear how it sounds! But first, a few adjustments are necessary.

Check your work first. Make sure no bare wires can touch the chassis (be careful of the leads coming through the old capacitor mounting hole). Make sure all hardware is tight – check everything

including all the original nuts and bolts at the tube sockets and the transformers. Re-read your original Dyna St-70 manual pages 7 through 10 (note that we have included the complete text of the original Dyna manual with our installation instructions for the new A.V.A. power transformer). These procedures still apply. You absolutely need a DC voltmeter to set the bias for the output tubes for reasonable performance and reliable operation. Get one now (Radio Shack is a convenient source) if you don't own one.

Reinstall the four 6CA7 power output tubes, the 5AR4 rectifier tube (if the original power transformer is being used), and the two new 6GH8A front end tubes. Note that you can no longer use the old 7199 tubes as the pinout to the tube sockets have been changed to accommodate the better 6GH8A tubes.

Note that bias is measured with the meter switched to DC volts on a low voltage range, with the ground wire of the meter connected to the chassis and the hot lead inserted into the "Bias set" pin on the power-take-off socket for the channel under test. Bias is adjusted with a screwdriver inserted through the PC card from the top to the bias potentiometer of that channel. Note that the adjustments for the two channels interact. When you turn the bias up on one channel, that will cause the bias to drop on the other channel and vice-versa. Thus you must go back and forth between the two channel measuring and adjusting until you get both channels dialed in. Note also that the bias reading will vary proportionately with changes in your home's AC power voltage. Thus it is normal to see the reading move up and down a little as your AC line voltage fluctuates.

We advise that you start with both bias pots turned all the way down (counter-clockwise) instead of following Dyna's directions. The initial readings will then tell you a lot about the condition of your output tubes. With good normal tubes in a good working amplifier, the bias reading with the pots turned all the way down will be about 1.0 volts. With very low gain or worn out tubes, the reading may be as low as 0.3 volts. After confirming how your tubes read with the bias turned down, proceed as follows:

If the initial reading is normal (between about 0.7 and 1.3 volts) then proceed to adjust the trimpots to provide exactly a 1.56 volt bias reading on each channel (which should occur near mid-rotation of each trimpot). Watch the readings for several minutes to make sure a tube is not going into "run-away" – starting to glow cherry red with a rapidly rising bias reading. If all is normal you have a finished and working Super 70i and we want to hear from you as to how you like the new soundstage it provides.

If the initial reading is very low then you have low gain or worn out tubes and you may not be able to turn the bias pots up enough to get the readings up to 1.56 volts. You need to replace your four 6CA7 output tubes before proceeding. Caution – an initial excessively high reading (over 1.6 volts) probably indicates a defective tube or a wiring error with the bias supply. Watch the tubes carefully for signs of overheating and double check your assembly work.

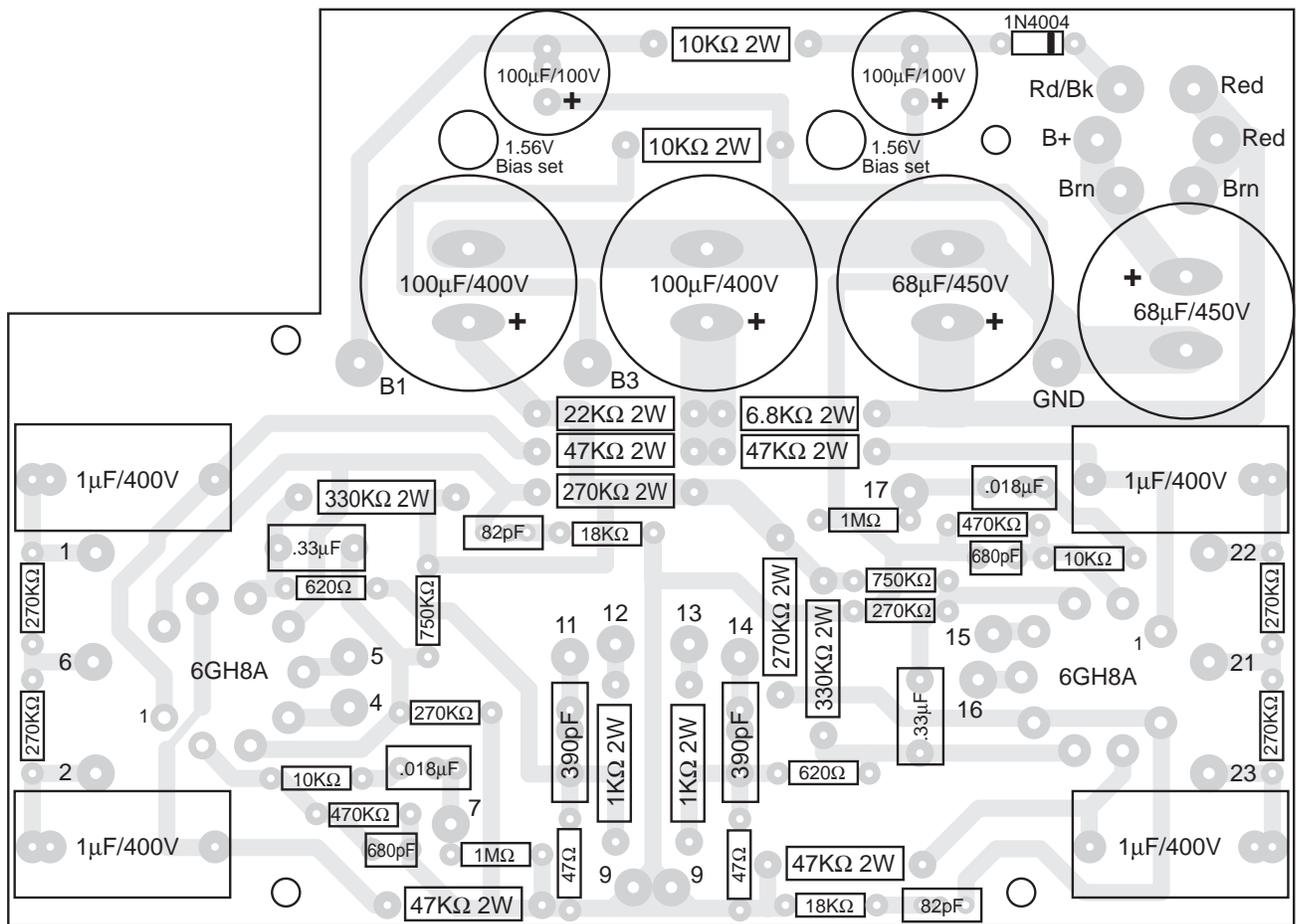
Note that you can obviously track down a sagging tube by swapping it (with or without its mate) from channel to channel and observe what happens to the bias reading on the channel the suspect tube is in. Always turn the amplifier off before changing tubes and note that it is easy to burn yourself handling hot output and rectifier tubes. If you need help, call us at 612 890-3517 and ask for Dave, Aado, or me. Sorry, we just don't have time to respond to kit building problems in writing so please do not write for free advice, call us instead.

There you have it folks, the Super 70i. Have fun with it. Note that the schematic of the Super 70i provided for informational purposes shows the unit after the installation of the optional A.V.A. power transformer which eliminates the 5AR4 tube. With the original

transformer, the 5AR4 tube must be retained or the supply voltages will go too high. Do not replace the 5AR4 tube with a diode bridge unless the transformer is replaced with the lower voltage, higher current A.V.A. transformer. This \$100 kit option (or \$150 installed by AVA) can be installed at any time and comes complete with the new diode bridge parts and instructions.

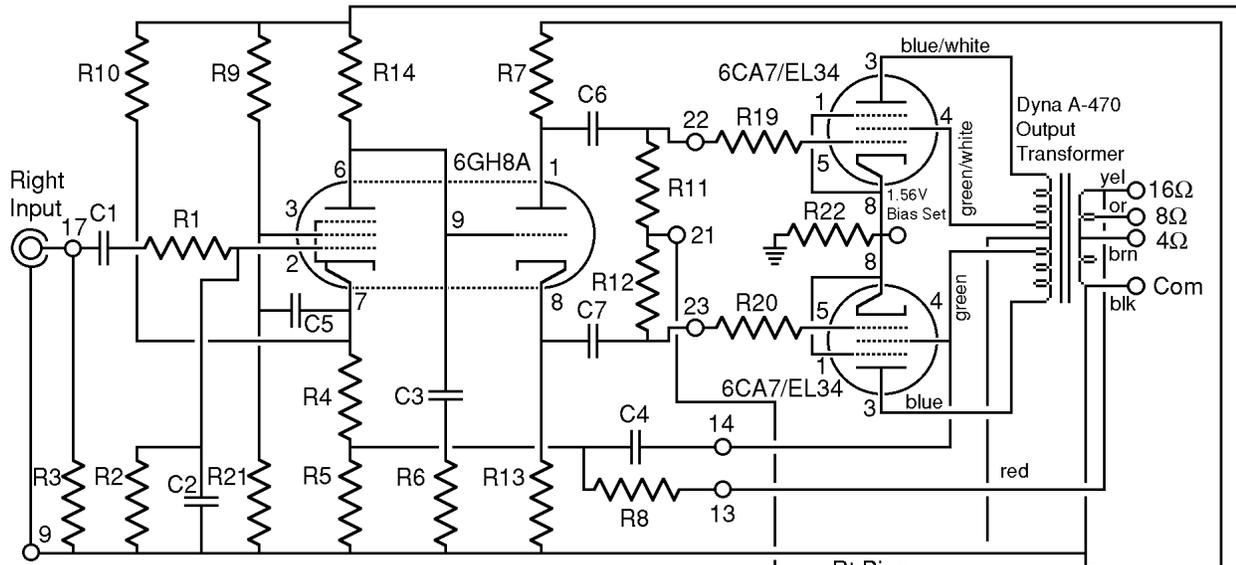
**Notice regarding parts supplied.**

We reserve the right to substitute parts of equivalent (or better) quality in order to maintain reasonable production schedules. For example, you may receive resistors of a greater wattage rating than specified and/or capacitors of a higher voltage rating than specified.

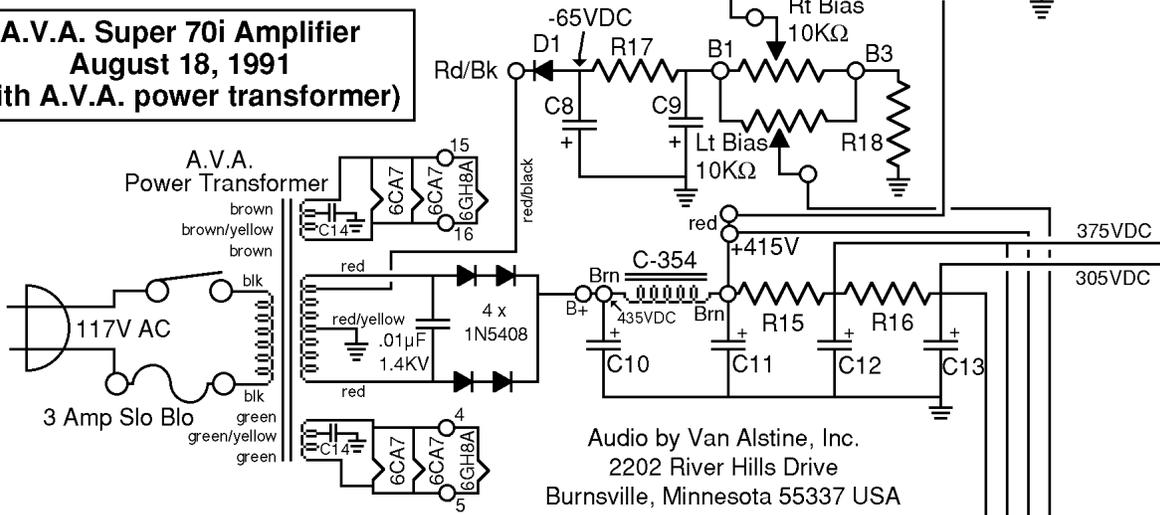


**Audio by Van Alstine • Super 70i Amplifier • Parts List**

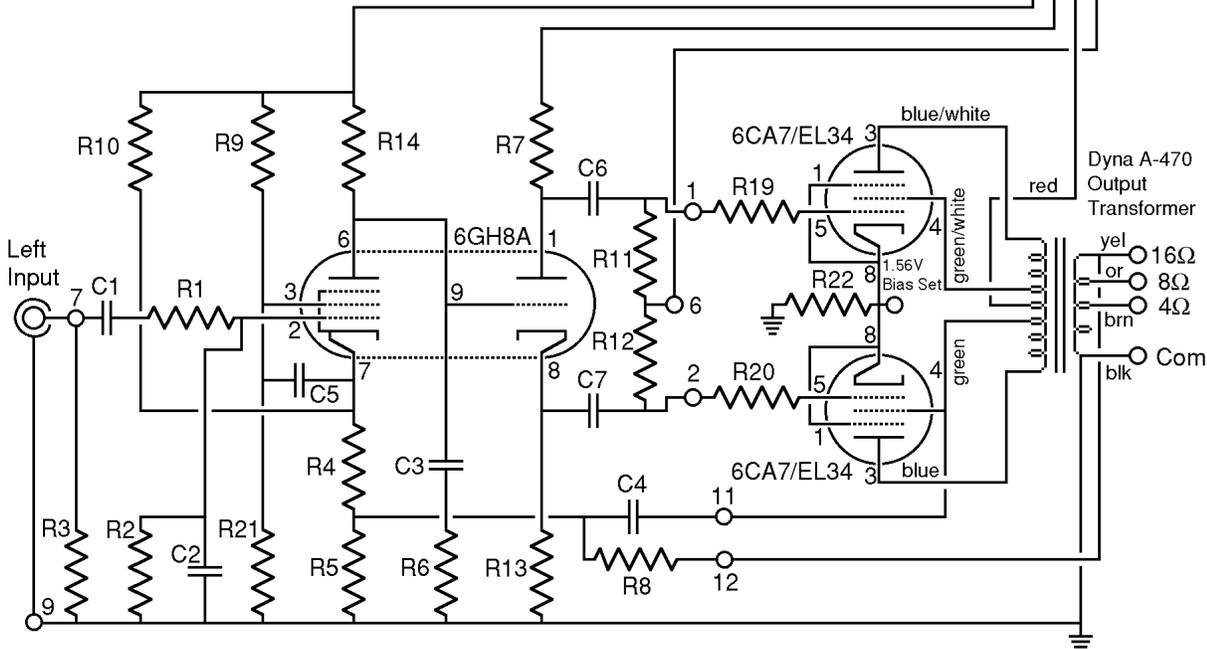
- |   |         |                                            |     |     |                                            |
|---|---------|--------------------------------------------|-----|-----|--------------------------------------------|
| 1 | PC-189A | Circuit Card                               | 2   | C1  | .018µF 50V polypropylene capacitor         |
| 2 | R1      | 10KΩ 1/2W resistor (1002F)                 | 2   | C2  | 680pF 50V polypropylene capacitor          |
| 2 | R2      | 470KΩ 1/2W resistor (4753F)                | 2   | C3  | 82pF 500V silver mica capacitor            |
| 2 | R3      | 1MΩ 1/2W resistor (1004F)                  | 2   | C4  | 390pF 500V silver mica capacitor           |
| 2 | R4      | 620Ω 1/2W (matched to 1%)                  | 2   | C5  | .33µF 250V film capacitor                  |
| 2 | R5      | 47Ω 1/2W resistor (47R5F)                  | 2   | C6  | 1µF 400V film capacitor                    |
| 2 | R6      | 18KΩ 1/2W resistor (1822F)                 | 2   | C7  | 1µF 400V film capacitor                    |
| 2 | R7      | 47KΩ 2W resistor (matched to 1%)           | 1   | C8  | 100µF 100V electrolytic capacitor          |
| 2 | R8      | 1KΩ 2W resistor (matched to 1%)            | 1   | C9  | 100µF 100V electrolytic capacitor          |
| 2 | R9      | 750KΩ 1/2W resistor (7503F)                | 1   | C10 | 68µF 450V electrolytic capacitor           |
| 2 | R10     | 330KΩ 2W resistor (orange, orange, yellow) | 1   | C11 | 68µF 450V electrolytic capacitor           |
| 2 | R11     | 270KΩ 1/2W (2743F) (matched to 1%)         | 1   | C12 | 100µF 400V electrolytic capacitor          |
| 2 | R12     | 270KΩ 1/2W (2743F) (matched to R11)        | 1   | C13 | 100µF 400V electrolytic capacitor          |
| 2 | R13     | 47KΩ 2W resistor (matched to R7)           | 1   | C14 | .02µF double disc capacitor (not supplied) |
| 2 | R14     | 270KΩ 2W resistor (red, violet, yellow)    | 1   | D1  | 1N4004 or 1N4007 silicon diode             |
| 1 | R15     | 6.8KΩ 2W resistor                          | 1   |     | 3 lug (2 ungrounded) terminal strip        |
| 1 | R16     | 22KΩ 2W resistor                           | 2   |     | 9-pin tube sockets                         |
| 1 | R17     | 10KΩ 2W resistor                           | 2   |     | 6GH8A tubes                                |
| 1 | R18     | 10KΩ 2W resistor                           | 4   |     | 1/2" #6-32 threaded spacers                |
| 2 | R19     | 1KΩ 1/2W resistor (1001F)                  | 9   |     | 1/4" #6-32 machine screws                  |
| 2 | R20     | 1KΩ 1/2W resistor (1001F)                  | 8   |     | #6 lockwasher                              |
| 2 | R21     | 270KΩ 1/2W resistor (2743F)                | 1   |     | #6-32 kep nut                              |
| 2 | R22     | 15.6Ω resistor (not supplied – see note)   | 10' |     | 20 gauge insulated hookup wire             |



**A.V.A. Super 70i Amplifier**  
**August 18, 1991**  
**(with A.V.A. power transformer)**



Audio by Van Alstine, Inc.  
 2202 River Hills Drive  
 Burnsville, Minnesota 55337 USA



A.V.A. Super 70i Pictorial Diagram

